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| 09/902,699 | 07/12/2001 | Hiroshi Miura | 211375US2 | 1573 |

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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

AGUSTIN, PETER VINCENT

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2652

DATE MAILED: 12/30/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/902,699

Applicant(s)

MIURA ET AL.

Examiner

Peter Vincent M Agustin

Art Unit

2652

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☒ Claim(s) 19 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

2. The disclosure is objected to because of the following informalities:

Page 2, line 6: Change "image" to --information--.

Page 28, lines 9, 14 & 17: Change "TW" to --Tw-- in order to match label in figure 4.

Appropriate correction is required.

Claim Objections

3. Claim 19 objected to because of the following informality:

Claim 19 recites the limitation "the information recording and reproducing method" on line 2 of the claim. There is insufficient antecedent basis for this limitation in the claim. The examiner suggests replacing "Claim 17" with --Claim 18--.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 4, 5, 16 & 17 rejected under 35 U.S.C. 102(b) as being anticipated by Kobayashi (US 5,144,615).

In regard to claim 4, Kobayashi discloses an information reproducing apparatus (figure 1, element 40; figure 3) for reproducing multi-leveled information recorded in a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) in the form of recording marks (figure 7) by the application of a recording laser beam (figure 1, element 11) thereto, by the application of a reproducing laser beam (figure 1, element 11) thereto, comprising: reproducing means (figure 1, element 40; figure 3) for reproducing said recording marks based on reference clock signals, with the timing of detecting a mark edge (figure 3, element 401) of each of said recording marks and the timing of detecting the intensity of a reflection light (figure 3, element 402) from each of said recording marks being made different (note elements 401 & 402 are provided separately).

In regard to claim 5, Kobayashi discloses that said reproducing laser beam has a smaller beam diameter than a beam diameter of said recording laser beam in terms of a beam diameter defined by $1/e^2$ (column 3, lines 14-17).

In regard to claim 16, Kobayashi discloses an information reproducing method (figure 1, element 40; figure 3) for reproducing multi-leveled information recorded in a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) in the form of recording marks (figure 7) by the application of a recording laser beam (figure 1, element 11) thereto, by the application of a reproducing laser beam (figure 1, element 11) thereto, comprising the step: reproducing said recording marks based on reference clock signals, with the timing of detecting a mark edge (figure 3, element 401) of each of said recording marks and the timing of detecting a reflection light intensity

(figure 3, element 402) of each of said recording marks being made different (note elements 401 & 402 are provided separately).

In regard to claim 17, Kobayashi discloses that said reproducing laser beam has a smaller beam diameter than a beam diameter of said recording laser beam in terms of a beam diameter defined by $1/e^2$ (column 3, lines 14-17).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-3, 6-13 & 18-22 rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi in view of Arioka et al. (hereafter Arioka) (US 2002/0034604 A1).

In regard to claims 1-3, Kobayashi in the optical recording art, discloses an information recording apparatus (figure 1, element 10; figure 2) for recording multi-leveled information in a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) by the application of a laser beam (figure 1, element 11) thereto, comprising: power level modification means (column 2, line 61 thru column 3, line 13) for modifying a power level of said laser beam into two or more power levels so as to correspond to said multi-leveled information. Kobayashi does not disclose setting a plurality of recording mark units including therein at least one recording mark to be formed, based on said modified power levels, so as to correspond to said multi-leveled information of claim 1; each of said recording mark units has a power level that

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corresponds to the total area of said one or more recording marks included in each of said recording mark units of claim 2; and each of said recording mark units includes one recording mark and has a track-direction length in a range of 0.5 to 1.0 times a beam diameter defined by $1/e^2$, and the area of said recording mark in each of said recording mark units is changed for recording said multi-leveled information of claim 3.

Arioka in the optical recording art, discloses an information recording apparatus (figure 2, element 30) comprising: setting a plurality of recording mark units (figure 3, element 40) including therein at least one recording mark (figure 3, elements 48A thru 48G) to be formed, based on said modified power levels, so as to correspond to said multi-leveled information. Furthermore, each of said recording mark units has a power level that corresponds to the total area of said one or more recording marks included in each of said recording mark units (page 5, paragraph 72); each of said recording mark units includes one recording mark (figure 3, elements 48A thru 48G) and has a track-direction length in a range of 0.5 to 1.0 times a beam diameter defined by $1/e^2$ (pages 4-5, paragraph 66); and the area of said recording mark in each of said recording mark units is changed (page 5, paragraph 68) for recording said multi-leveled information. It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to provide the recording mark units of Arioka to include therein the recording marks of Kobayashi, the motivation being to provide recording areas of equal sizes and limited lengths, thereby enabling higher density recording.

In regards to claims 6-9, Kobayashi in the optical recording art, discloses an information recording (figure 1, element 10; figure 2) and reproducing (figure 1, element

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40; figure 3) apparatus for recording multi-leveled information in a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) by the application of a recording laser beam (figure 1, element 11) thereto, reproducing multi-leveled information recorded in a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) by the application of a reproducing laser beam (figure 1, element 11) thereto, comprising: power level modification means (column 2, line 61 thru column 3, line 13) for modifying a power level of said recording laser beam into two or more power levels so as to correspond to said multi-leveled information, and reproducing means (figure 1, element 40; figure 3) for reproducing said recording marks (figure 7) based on reference clock signals, with the timing of detecting a mark edge (figure 3, element 401) of each of said recording marks and the timing of detecting a reflection light intensity (figure 3, element 402) of each of said recording marks being made different (note elements 401 & 402 are provided separately); and said reproducing laser beam has a smaller beam diameter than a beam diameter of said recording laser beam in terms of a beam diameter defined by $1/e^2$ (column 3, lines 14-17). Kobayashi does not disclose setting a plurality of recording mark units including therein at least one recording mark to be formed, based on said modified power levels, so as to correspond to said multi-leveled information of claim 6; each of said recording mark units has a power level that corresponds to the total area of said one or more recording marks included in each of said recording mark units of claim 7; and each of said recording mark units includes one recording mark and has a track-direction length in a range of 0.5 to 1.0 times a beam diameter defined by $1/e^2$, and the area of said

recording mark in each of said recording mark units is changed for recording said information of claim 8.

Arioka in the optical recording art, discloses setting a plurality of recording mark units (figure 3, element 40) including therein at least one recording mark (figure 3, elements 48A thru 48G) to be formed, based on said modified power levels, so as to correspond to said multi-leveled information. Furthermore, each of said recording mark units has a power level that corresponds to the total area of said one or more recording marks included in each of said recording mark units (page 5, paragraph 72); each of said recording mark units includes one recording mark (figure 3, elements 48A thru 48G) and has a track-direction length in a range of 0.5 to 1.0 times a beam diameter defined by $1/e^2$ (pages 4-5, paragraph 66); and the area of said recording mark in each of said recording mark units is changed (page 5, paragraph 68) for recording said information. It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to provide the recording mark units of Arioka to include therein the recording marks of Kobayashi, the motivation being to provide recording areas of equal sizes and limited lengths, thereby enabling higher density recording.

In regard to claims 10-13, Kobayashi in the optical recording art, discloses an information recording method (figure 1, element 10; figure 2) for recording multi-leveled information in a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) by the application of a laser beam (figure 1, element 11) thereto, comprising the steps of: modifying a power level of said laser beam into two or more power levels (column 2, line 61 thru column 3, line 13) so as to correspond to said multi-

leveled information; and in modifying said power level of said laser beam, at least one of said power levels is further changed in a level retention time thereof (column 5, lines 41-44) so as to correspond to said multi-leveled information. Kobayashi does not disclose setting a plurality of recording mark units including therein at least one recording mark to be formed, based on said modified power levels, so as to correspond to said multi-leveled information of claim 10; each of said recording mark units has a power level that corresponds to the total area of said one or more recording marks included in each of said recording mark units of claim 11; and each of said recording mark units includes one recording mark and has a track-direction length in a range of 0.5 to 1.0 times a beam diameter defined by $1/e^2$, and the area of said recording mark in each of said recording mark units is changed for recording said multi-leveled information of claim 12.

Arioka in the optical recording art, discloses setting a plurality of recording mark units (figure 3, element 40) including therein at least one recording mark (figure 3, elements 48A thru 48G) to be formed, based on said modified power levels, so as to correspond to said multi-leveled information. Furthermore, each of said recording mark units has a power level that corresponds to the total area of said one or more recording marks included in each of said recording mark units (page 5, paragraph 72); each of said recording mark units includes one recording mark (figure 3, elements 48A thru 48G) and has a track-direction length in a range of 0.5 to 1.0 times a beam diameter defined by $1/e^2$ (pages 4-5, paragraph 66); and the area of said recording mark in each of said recording mark units is changed (page 5, paragraph 68) for recording said multi-leveled information. It would have been obvious to one of ordinary skill in the art at the

time of invention by applicant to provide the recording mark units of Arioka to include therein the recording marks of Kobayashi, the motivation being to provide recording areas of equal sizes and limited lengths, thereby enabling higher density recording.

In regard to claims 18-21, Kobayashi in the optical recording art, discloses an information recording (figure 1, element 10; figure 2) and reproducing (figure 1, element 40; figure 3) method for recording multi-leveled information in a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) by the application of a recording laser beam (figure 1, element 11) thereto, and reproducing multi-leveled information recorded in a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) by the application of a reproducing laser beam (figure 1, element 11) thereto, comprising steps: modifying a power level of said recording laser beam into two or more power levels (column 2, line 61 thru column 3, line 13) so as to correspond to said multi-leveled information, and reproducing said recording marks (figure 7) based on reference clock signals, with the timing of detecting a mark edge (figure 3, element 401) of each of said recording marks and the timing of detecting a reflection light intensity (figure 3, element 402) of each of said recording marks being made different (note elements 401 & 402 are provided separately); and said reproducing laser beam has a smaller beam diameter than a beam diameter of said recording laser beam in terms of a beam diameter defined by $1/e^2$ (column 3, lines 14-17). Kobayashi does not disclose setting a plurality of recording mark units including therein at least one recording mark to be formed, based on said modified power levels, so as to correspond to said multi-leveled information of claim 18; each of said recording

mark units has a power level that corresponds to the total area of said one or more recording marks included in each of said recording mark units of claim 19; and each of said recording mark units includes one recording mark and has a track-direction length in a range of 0.5 to 1.0 times a beam diameter defined by $1/e^2$, and the area of said recording mark in each of said recording mark units is changed for recording said information of claim 20.

Arioka in the optical recording art, discloses setting a plurality of recording mark units (figure 3, element 40) including therein at least one recording mark (figure 3, elements 48A thru 48G) to be formed, based on said modified power levels, so as to correspond to said multi-leveled information. Furthermore, each of said recording mark units has a power level that corresponds to the total area of said one or more recording marks included in each of said recording mark units (page 5, paragraph 72); each of said recording mark units includes one recording mark (figure 3, elements 48A thru 48G) and has a track-direction length in a range of 0.5 to 1.0 times a beam diameter defined by $1/e^2$ (pages 4-5, paragraph 66); and the area of said recording mark in each of said recording mark units is changed (page 5, paragraph 68) for recording said information. It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to provide the recording mark units of Arioka to include therein the recording marks of Kobayashi, the motivation being to provide recording areas of equal sizes and limited lengths, thereby enabling higher density recording.

In regard to claim 22, Kobayashi in the optical recording art, discloses a phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40)

comprising a recording layer (figure 4, element 23) in which multi-leveled information can be recorded by an information recording method (figure 1, element 10; figure 2) for recording multi-leveled information in a phase-change recording medium by the application of a laser beam (figure 1, element 11) thereto, comprising the steps of: modifying a power level of said laser beam into two or more power levels (column 2, line 61 thru column 3, line 13) so as to correspond to said multi-leveled information. Kobayashi does not disclose setting a plurality of recording mark units including therein at least one recording mark to be formed, based on said modified power levels, so as to correspond to said multi-leveled information.

Arioka in the optical recording art, discloses setting a plurality of recording mark units (figure 3, element 40) including therein at least one recording mark (figure 3, elements 48A thru 48G) to be formed, based on said modified power levels, so as to correspond to said multi-leveled information. It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to provide the recording mark units of Arioka to include therein the recording marks of Kobayashi, the motivation being to provide recording areas of equal sizes and limited lengths, thereby enabling higher density recording.

8. Claims 14-15 rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi and Arioka as applied to claim 10 above, and further in view of Hasegawa (US 5,555,236).

Kobayashi and Arioka disclose all the claimed features as noted in the 103 rejection above. Furthermore, in regard to claim 14, Kobayashi discloses that the power

level of said laser beam is modified into three power levels (column 2, lines 64-66). In regard to claim 15, Kobayashi (column 5, lines 55-57) and Arioka (page 5, paragraph 75) disclose that in modifying said power level of said laser beam, at least one of said recording power level or said bias power level is further changed in a power level retention time thereof in accordance with said multi-leveled information. However, it is not disclosed that the three power levels comprise a recording power level, an erasing power level and a bias power level, with the respective power levels thereof being set in a decreasing order of said recording power level, said erasing power level, and said bias power level (said recording power level > said erasing power level > said bias power level), according to claim 14.

Hasegawa in the magneto-optical recording art, discloses in figure 9(a) a recording power level (Pw), an erasing power level (Pe) and a bias power level (lowest level of the signal), with the respective power levels thereof being set in a decreasing order of said recording power level, said erasing power level, and said bias power level (as shown in figure 9(a)). It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to define the three power levels of Kobayashi as recording, erasing and bias power levels as suggested by Hasegawa, in order to form recording marks shaped as shown in figure 9(b) of Hasegawa, thereby enabling multi-level recording.

9. Claim 23 rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi and Arioka as applied to claim 22 above, and further in view of Kasami et al. (hereafter Kasami) (US 6,312,780).

Kobayashi and Arioka disclose all the claimed features as noted in the 103 rejection above. Furthermore, Kobayashi disclose that the recording layer (figure 4, element 23) of the phase-change recording medium (figure 1, element 20; figure 4; column 4, lines 33-40) comprises Sb and Te, and at least one element selected from the group consisting of Ag, In, Ge, Ga, B, Si, and Al (column 4, lines 47-50). However, it is not disclosed that the Sb/Te content ratio is 2 to 5 in terms of atomic %.

Kasami in the optical recording art, discloses in figures 10 & 13 that the Sb/Te content ratio is 2 to 5 in terms of atomic %. It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to provide the recording layer of Kobayashi with a material comprising of Sb and Te with a SB/Te content ratio of 2 to 5 in terms of atomic % as suggested by Kasami, the motivation being to provide a phase-change recording medium with optimum characteristics (see column 12, lines 11-15).

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Iwasaki et al. (US 5,761,179) and Hurst, Jr. (US 5,631,887) disclose optical recording methods using pulse width modulation techniques.

Clark et al. (US 5,802,031) disclose a programmable writing system for an optical disk drive adaptable for pulse position modulation and pulse width modulation.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter Vincent M Agustin whose telephone number is

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(703) 305-8980. The examiner can normally be reached on Monday thru Friday
9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa T Nguyen can be reached on (703) 305-9687. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3718.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Peter Agustin
12/22/2003



BRIAN E. MILLER
PRIMARY EXAMINER